COMPETENCY PROFILE:

# AUTOMOTIVE ENGINEER

## ROLE OVERVIEW

Automotive engineers are involved in designing and establishing product and quality control standards for motor vehicles, including motorcycles, cars, trucks, and buses, along with their associated engineering systems. They are responsible for developing new vehicles or mechanical components, overseeing modifications, and resolving technical problems. They ensure that the designs adhere to cost requirements and other limitations. Additionally, automotive engineers engage in research and development activities that explore the safety, efficiency, and design elements of vehicles and their subsystems. Automotive engineers are also involved in planning and designing manufacturing processes. Automotive engineers utilize their engineering expertise in a business-oriented manner, as their innovations and solutions are significant for effectiveness and profitability.

As an automotive engineer, you are responsible for developing, releasing, and validating product components and systems per global engineering standards throughout the entire product life cycle. You are expected to apply your technical skills to plan and design products and systems and lead and coordinate activities involved in the fabrication, operation, application, installation, and re-work procedures of products and systems.

Automotive engineers require essential knowledge in various areas to be successful in their field. Understanding engineering principles is vital, as it forms the foundation for designing and developing automotive products and components that are efficient and reliable. Proficiency in engineering processes enables engineers to effectively manage projects, conduct feasibility studies, and support pre-production activities. Knowledge of product measures ensures that engineers can optimize manufacturing processes, minimize costs, and enhance productivity. Furthermore, automotive engineers must follow strict quality standards to ensure vehicle safety, performance, and reliability. This adherence guarantees customer satisfaction and meets industry regulations.

## ALSO KNOWN AS:

- Vehicle Design Engineer
- Motor Vehicle Research and Development Engineer
- Automotive Systems Engineer
- Automotive Product Development Engineer
- Vehicle Dynamics Analyst
- Automotive Manufacturing Engineer
- Automotive Quality Assurance Engineer
- Vehicle Safety Engineer
- Automotive Project Engineer

## NATIONAL OCCUPATIONAL CLASSIFICATION:

- 21301 – Mechanical engineers

## EDUCATION AND EXPERIENCE

- A bachelor's degree in mechanical engineering or a similar field is essential.
- Specific roles might require a master's or doctorate in a related engineering field.
- In Canada, a license from a provincial or territorial professional engineers' association is required to approve engineering drawings and reports and practice as a Professional Engineer (P.Eng.).
- Graduates from accredited engineering programs become eligible for registration after completing three to four years of supervised engineering work experience and passing a professional practice exam.
- A minimum of three to five years of relevant experience is necessary, with a preference for five to seven years of experience in the field.

## TECHNICAL

### Research and Development

Applies scientific methods and techniques using empirical and measurable observation in their research to improve, correct, or increase knowledge in a field of study to solve specific problems.

- Conduct research studies to innovate within automotive engineering.
- Investigate or apply alternative fuels, electric or hybrid vehicles, and designs for lighter, more fuel-efficient cars.
- Explore telematics, intelligent transportation systems, artificial intelligence, and automated vehicle control.
- Reads current literature, attends meetings, and conferences, and discusses with colleagues to stay current on new automotive technology or competitive products.

### Engineering Design

Oversees the technical elements of engineering project planning and design to guarantee safe, efficient, and practical construction.

- Conducts automotive design reviews to develop engineering specifications or cost estimates for automotive design concepts.
- Creates vehicles using lightweight materials like aluminum, magnesium alloy, or plastic to enhance fuel efficiency.
- Designs vehicle parts prioritizing recyclability and incorporating natural, renewable, or recycled materials.
- Adjusts designs to meet specific functional or operational criteria, ensuring durable and dependable automotive systems.
- Propose technical design or process changes to improve product, structure, system efficiency, quality, or performance.
- Design components to comply with applicable safety standards to mitigate adverse risks to the consumer.
- Designs or improves on cyber-physical systems to help grow the capabilities of automotive vehicles.
- Utilizes various safety analysis techniques to identify potential safety issues and devise mitigation strategies.

- Design safety architectures and redundancy schemes to achieve the required safety integrity levels, considering factors like fault tolerance, diagnostic coverage, and common cause failures to ensure the finished product is as safe as possible.

## Engineering Review and Analysis

Reviews and analyzes relevant information about technical designs and complex systems to develop appropriate solutions.

- Assesses the functionality, replicability, costs, and other factors to be considered to develop appropriate technical solutions to engineering-related problems.
- Evaluate automotive systems in specific areas of expertise to improve the efficiency, operations or performance of a product, part, or system.
- Develops various levels of automotive test scenarios to accurately test and qualify automotive products.
- Evaluate technical data to determine the effect on designs or plans.
- Write, review, or maintain engineering documentation to promote consistency in all engineering aspects.

## Quality Assurance and Quality Control

Follows appropriate processes directed by global engineering standards and industry best practices to maintain quality throughout operations.

- Analyzes product proposals and specifications to determine feasibility or application to establish quality control standards.
- Provides access to product performance attributes from the plant floor for engineering to drive issue resolution and long-term design robustness in coordination with product engineering.
- Directs testing activities for components and equipment under designated conditions to ensure operational performance meets project specifications with proven reliability.
- Coordinates production activities with other functional units, such as procurement and manufacturing, to ensure standardization and consistency.
- Conducts spot checks to ensure the existing resources adhere to the decided standards and meet expectations.
- Maintains and organizes lessons learned discussions from the project to ensure that errors are not repeated in the future.

## Continuous Improvement

Analyze, innovate, and refine product systems and practices to drive positive change and optimize performance to improve efficiency and quality.

- Assesses possible process improvements that positively influence the overall functionality of the product.
- Participates in cross-functional teams to identify cost-saving opportunities.
- Applies continuous improvement methods to enhance reliability and cost-effectiveness.

- Tracks and approves continuous improvement activities (process validation studies) to enhance operating product performance.

## Project Team Management

Oversees a team of professionals to effectively and efficiently produce the required output to ensure project[s] are completed on time and within budget.

- Develops project plans and set milestones to facilitate successful project completion.
- Takes corrective measures to address technical issues when projects deviate from their planned course, ensuring timely completion.
- Ensures that available resources are appropriately allocated to ensure resources are used at total capacity.
- Documents insights gained from project execution to improve risk mitigation strategies in future projects.
- Manages tasks according to the approved scope of work to deliver quality reports on schedule and within budget.

## New Product Development

Applies appropriate processes and procedures to develop new products or components to ensure products meet engineering standards and intended customer needs.

- Applies engineering concepts for specifications for new products or component development to ensure optimal product performance.
- Performs market research to grasp customer preferences and integrates those insights into product design, ensuring it matches the target market's needs and intended uses.
- Analyzes material costs and manufacturing processes to optimize the overall cost of products without compromising quality, ensuring cost-effective solutions.
- Manages the design validation planning and execution to ensure products conform to intended specifications and performance requirements.

# PERSONAL & PROFESSIONAL

## Problem-Solving

Identifies problems and uses logic, judgment, and evidence to evaluate alternative scenarios and recommend solutions to achieve a desired goal.

- Conduct root cause analysis to identify issues or failures to develop innovative solutions.
- Analyze data to evaluate operational challenges to prevent recurrence.
- Considers several possible explanations or alternatives for a situation, anticipates potential obstacles, and develops plans to overcome them.
- Applies a balance of logic and creativity to generate novel approaches to produce a cognisant and comprehensive solution.

## Communication

Positively directs outcomes by delivering communication that better understands goals and objectives, captures interest, and gains support for immediate action.

- Explain novel or complex engineering concepts and related facts appropriately to an audience to explain aspects of the design process and proposal.
- Actively listens to team members to address concerns and integrate ideas, values, and new information, where appropriate.
- Communicate manufacturing capabilities, product development schedules, or other information to facilitate production processes.
- Use unambiguous language for communication to aid team members in accomplishing their objectives more efficiently or effectively.

## Attention to Detail

Review completed work by monitoring and checking information, organizing tasks and resources efficiently, and assessing all areas involved in achieving an objective.

- Catches and corrects errors or omissions, where applicable, to reduce future performance issues so that products, systems, or applications operate as expected.
- Double-check the accuracy of the information and work to provide accurate and consistent work.
- Establish procedures or processes to validate information to minimize disruptions and ensure the project meets deliverables.
- Routinely checks in with team members to consider changing priorities or expectations to produce results that improve relationships and business objectives.

# LEGAL, POLICY, AND REGULATORY

## Regulatory Compliance

Adheres to specific regulations, codes, and legislation within a defined jurisdiction to ensure the health and safety of others.

- Consults with different government agencies to secure regulatory approvals and permits.
- Reviews and applies relevant regulations, legislation, and standards to ensure the project complies with them.
- Participates in developing internal policy and procedures to ensure all legal requirements conduct assessments.
- Writes, reviews, and maintains engineering documentation to ensure compliance with engineering standards and regulations



Funded by the Government of Canada's Sectoral Workforce Solutions Program | Canada